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Videogames at the service of the education of the person-child and movement

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Abstract

Introduction. Exergames are an innovative educational resource that addresses children's passive use of technology and sedentary lifestyles.
Methods. This research analyzes their effectiveness as tools to support physical education in schools and children's overall development, highlighting the various benefits and critical issues identified in the literature
Results. The results demonstrate developments in motor, cognitive, and social skills, with evidence also supporting inclusiveness. Despite some limitations, the review highlights the opportunities exergames offer to promote physical activity, active learning, and integration into lesson planning.

Key words: *exergames, children, physical education, movement, obesity*

Introduction

In recent years, video games have undergone a major evolution, transforming from simple entertainment devices into genuine cultural, educational, and training tools. One example of this is exergames, an innovative category that combines the digital world with physical movement (Suhonen et al., 2008), offering new opportunities, especially in the field of children's physical education: they are therefore referred to as ''active video games''. Therefore, this research aims to investigate the educational potential of exergames in physical education, examining their characteristics, benefits, and possible critical issues. The goal is to understand how these tools can be introduced into school and educational contexts to encourage movement and promote children's well-being and learning. Through a review of recent studies, the benefits that exergames can have in terms of motivation, active involvement, and learning are analyzed. The focus is mainly on the teacher, understood as a facilitator of the playful-educational experience, and on how educational design can consciously integrate digital technologies. Finally, a critical reinterpretation of data from critics is proposed, highlighting the pros and cons of using exergames in school settings. This review, therefore, is part of a current and stimulating field of research that combines education, technology, and movement, with the aim of offering concrete ideas for a more active, motivating, and inclusive education that is capable of responding to the current needs of children. The intention is to propose a positive and informed view of digital technology, promoting a critical and constructive approach to video games, seeing them as educational tools, without excluding the potential risks and valuing their numerous opportunities for education and physical activity.

The importance of physical activity in children

Physical activity is one of the fundamental pillars of child development. It influences not only their physical growth but also their cognitive, emotional, and social maturation. During childhood, the body and mind are closely interconnected. Through play, jumping, running, dancing, and all structured motor activities, children explore themselves and the world around them, developing skills necessary for their lives. Exergames are playing an increasingly important role in this context (Gao & Xiang, 2013). Games such as Beat Saber, Wii Fit Plus, and Just Dance are effective tools that integrate digital gaming with real physical activity. According to the World Health Organization (WHO), physical activity is essential for health and well-being, while physical inactivity and a sedentary lifestyle contribute to an increase in non-communicable diseases.

Several studies have shown that sedentary behavior can be associated with various negative health effects. For example, in children and adolescents, there is an increase in adiposity, a worsening of cardiometabolic health, physical fitness, and prosocial behavior, and a reduction in sleep duration (WHO, 2020). Movement plays an important role among the factors that support children's cognitive development. In particular, according to Diamond and Lee (2011), engaging in motor activities that involve rules and complexity stimulates the development of executive functions, including the ability to retain information, inhibit automatic responses, and adapt to new situations. Some studies have highlighted the positive impact of physical activity on children's physical and relational well-being. Regular physical activity is effective in reducing the symptoms of anxiety and depression-related disorders, supports emotional regulation, and promotes increased self-esteem (Biddle & Asare, 2011).

In addition, group motor play (Bailey et al., 2009) provides a stimulating educational context for the acquisition of social and relational skills, promoting cooperation, the development of empathy, and the regulation of interpersonal conflicts. To ensure that children have various daily opportunities for movement, collaboration between different contexts is necessary: family, school, and society. In fact, physical education should not be limited to the weekly hour spent in the school gym, but should be integrated throughout the day through active breaks, free or structured play, outdoor activities, games in the park, and sports training. To make movement even more effective, it is useful to combine traditional physical exercise with exergames. Therefore, movement is a biological and psychological necessity that influences the development, health, and quality of life of every human being. Investing in physical education and active play (exergames) means taking the overall growth of children to heart, promoting healthier, happier, and more resilient generations.

Exergames as tools for physical education

In recent years, thanks to the introduction of new technologies, there has been a significant shift in the field of physical education that has transformed teaching methods and introduced new ways of learning motor skills. The use of technology, especially in schools, has increased student motivation and participation, allowing for better assessment and personalization of their physical performance (Papastergiou, 2009). Traditional physical education, which involves practical activities in the gym or outdoors, is thus enriched with innovative tools such as exergames, augmented reality, and virtual reality. Among the most popular tools used in schools are exergames. These video games require users to perform physical movements that are detected and interpreted by sensors, allowing them to combine physical exercise with play (Staiano & Calvert, 2011). According to Baranowski

and colleagues (2007), the use of these tools can improve physical activity in educational contexts where it is more difficult to maintain attention. In particular, games such as Nintendo Wii Fit and Xbox have been used to improve balance and coordination, encouraging greater involvement in physical education (Marsigliante et al., 2024). However, it should be noted that exergames should be seen as a supplement to physical exercise and not as a substitute for traditional physical activity, as direct social contact and outdoor play continue to be essential for the child's complete motor development. In fact, in a mixed context, new technologies can counteract sedentary lifestyles and obesity. At the same time, game-based learning and gamification (Camacho-Sànchez et al., 2023) demonstrate an increase in interest and participation in physical education classes. Furthermore, thanks to the possibility of adapting the difficulty levels for each child, exergames are also inclusive, giving pupils with special educational needs the opportunity to actively participate in various physical activities (Gao & Chen, 2014).

Other research, however, has shown that frequent use of exergames improves cognitive abilities in school-age children. In particular, a study conducted by Zhao and colleagues (2024) showed that students involved in physical education activities using exergames have higher levels of physical activity and a positive attitude toward school. Therefore, research shows that exergames, when used in school settings for physical activity, can:

- improve balance and strength in children
- enhance motor learning
- support executive functions, especially if the context is well structured
- increase motivation and participation
- include children with disabilities and special educational needs

However, exergames should not be used as a substitute for physical activity, but can be integrated into the physical education curriculum through short interventions, with pilot classes and clear objectives. Furthermore, the introduction of exergames in schools opens the door to more fun, interactive, and motivating teaching. In an increasingly digital and technological world, it is possible to transform technology from a tool for sedentary lifestyles into a resource for movement and learning. Today, schools have the opportunity to guide this change in a conscious and constructive way, focusing on the physical and cognitive well-being of children.

Materials and method

The systematic review was conducted between September 2024 and July 2025. The latest update of the research was carried out between July 12 and 15, 2025, in order to include more recent and up-to-date studies on exergames as tools for children's education and movement.

The review was designed in several steps:

- selection of the topic and formulation of the question
- consultation of online search engines based on the chosen keywords
- identification and selection of studies for analysis through the application of inclusion and exclusion criteria
- summary tables of data and protocols
- reading and analysis of selected articles.

The research was carried out using the following databases: PubMed, Google Scholar, SportDiscus, ERIC, and PsycINFO. The keywords used were: exergames, children, primary school, disability, physical education, movement, education, and obesity. The bibliographic references of the various articles were also examined to ensure a comprehensive and in-depth search of the literature on exergames, education, and child movement. The research was then developed in several steps: from the initial search, an initial selection of works was made, taking into account the title and keywords of each result. Duplicate articles, i.e., those identified in multiple searches, were discarded from the list obtained. Subsequently, a further selection step was carried out by carefully reading first the titles and then the abstracts of the articles, a process useful for taking into account the objectives of this review. A more careful analysis was carried out considering the articles that met all the inclusion criteria.

Inclusion criteria

The following inclusion criteria were taken into consideration:

- studies published between 2000 and 2025, experimental
- quasi-experimental and RCT (Randomized Controlled Trial) studies in a school setting
- full-text articles
- texts in English and Italian
- types of sources: journals, reports, academic publications, full texts
- sample age between 4 and 12 years, with and without disabilities.

Exclusion criteria

The following exclusion criteria were considered:

- duplicate articles
- articles published more than 12 years ago
- inconsistent titles and abstracts
- texts in languages other than English and Italian.

The PICO model was used to highlight the key elements of the survey. (Table 1).

Table 1. Application of the P.I.C.O. model. (*Source:* own elaboration)

COMPONENT	DESCRIPTION
Population	Preschool and primary school children, children with typical development and developmental disorders (DCD, ADHD), and with special educational needs
Intervention	Exergames such as Wii Fit, Xbox Kinect, and digital games with motor and cognitive challenges
Comparison	Traditional physical activity, classic games, standard motor programs
Outcome	Improvements in motor skills, executive functions, fitness, self-awareness, motivation, and social inclusion

Results

The bibliographic search yielded a total of 789 results, of which 756 were obtained from various international databases, and 33 were found in other sources. After removing duplicates (n = 254), 535 articles were initially reviewed based on their titles and keywords used in the search, and 342 were excluded. In the next phase, they were reviewed based on the abstracts (62 were excluded), and a search was conducted for full-text articles with an analysis of eligible studies, taking into account the inclusion criteria.

Of the 131 remaining articles, 116 were excluded for the following reasons:

- 44 did not include experimental interventions
- 45 did not reflect the age of the sample
- 27 were duplicates.

At the end of the screening process, 15 studies were included in the systematic review (Figure 1).

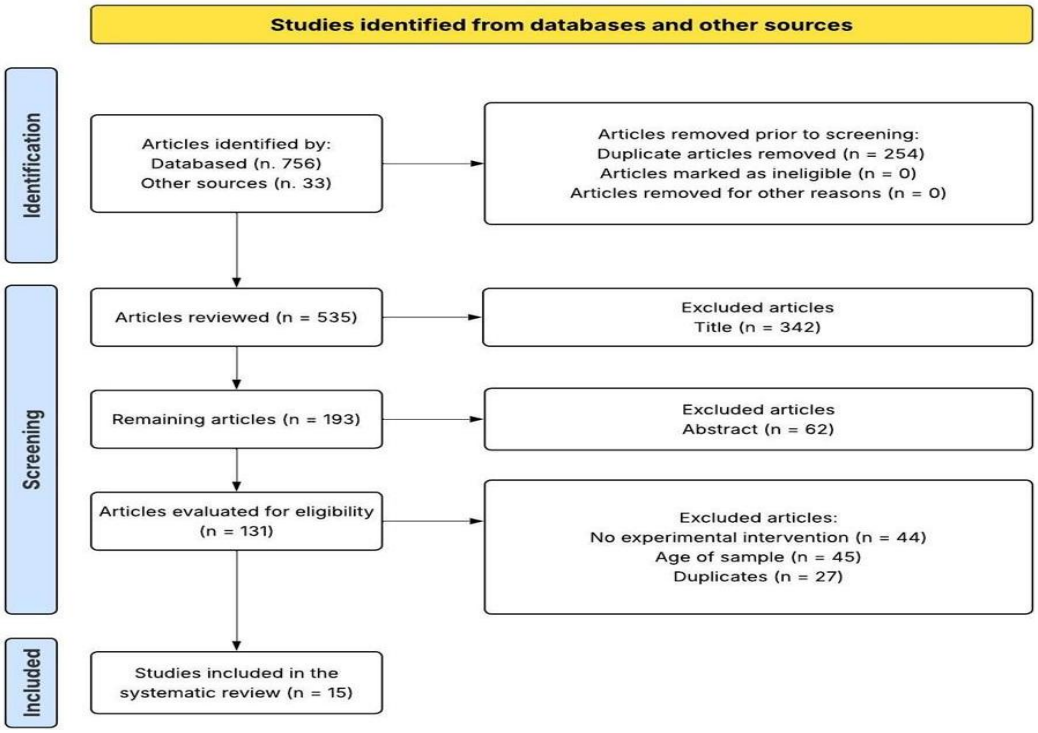

Fig 1. PRISMA flow chart of the literature search and selection process. *(Source:* own elaboration.)

The 15 studies include the following timeline: (n=1) year 2017, (n=2) year 2018, (n=2) year 2019, (n=2) year 2021, (n=3) year 2022, (n=2) year 2023, (n=2) year 2024, (n=1) year 2025. Among these, 2 were conducted in the United States, 3 in China, 1 in Taiwan, 2 in Italy, 1 in Greece, 2 in South Korea, 1 in South Africa (Cape Town), 1 in Spain, 1 in Germany, and 1 in Brazil. The different results allow us to trace the development of various research paths in the field of motor activity in chronological order, especially with regard to the use of exergames in education/inclusion and in children's movement focused on:

- evaluation of exergames on children's sedentary behavior integrated into school programs (Gao et al., 2017)
- effectiveness of exergames for balance and movement skills (Sgrò et al., 2018) and children's physical performance (Lin et al., 2025)
- promotion of movement and combination of exergames and traditional physical activity (Ye et al., 2018), improving BMI (Roglin et al., 2024), physical composition, and athletic ability (Marsigliante et al., 2024)
- effects of exergames on executive functions (Xiong, Zhang, Gao, 2019; Gai et al., 2021; Liu et al., 2022; Kolovenolis, 2023)
- effects of exergames on children with disabilities and BES: motor learning in children with DCD (Cavalcante Neto et al., 2021), effects of exergames on physical and motor fitness in children with DD (Kwon et al., 2022), effects of aerobic exercise exergames on attention in children with ADHD (Ji et al., 2023), effects of exergames on fitness in children with coordination disorders (Smits-Engelsman et al., 2021)
- effectiveness of exergames in obese or overweight children (Comeras-Chueca et al., 2022)

The studies were conducted on a sample ranging in size from a minimum of 29 children (Comeras-Chueca et al., 2022) to a maximum of 261 (Gao et al., 2017; Ye et al., 2018), with ages ranging from 4 to 12 years. The target population includes studies of children with SEN, overweight children, children with ADHD, children with DCD, and typically developing children. Among these, the majority of studies concern typically developing children, and a minority concern children with BES (Figure 2).

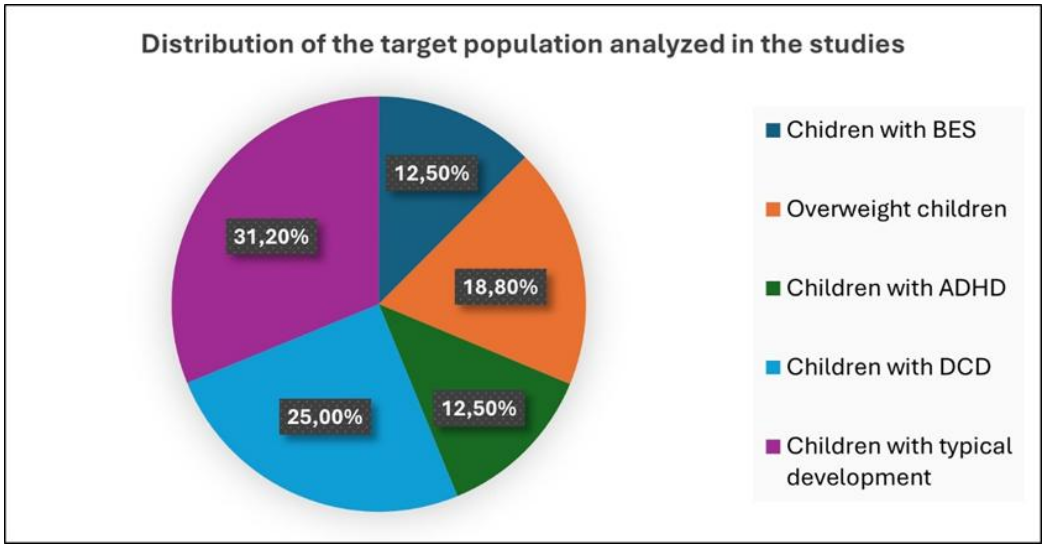

Fig 2. Distribution of the target population in the studies included in the review. *(Source:* own elaboration).

The areas of research focused on motor skills/coordination, executive functions, fitness/body composition, motivation/self-efficacy, and inclusion/school context. Figure 3 shows the data with the frequency of the number of studies.

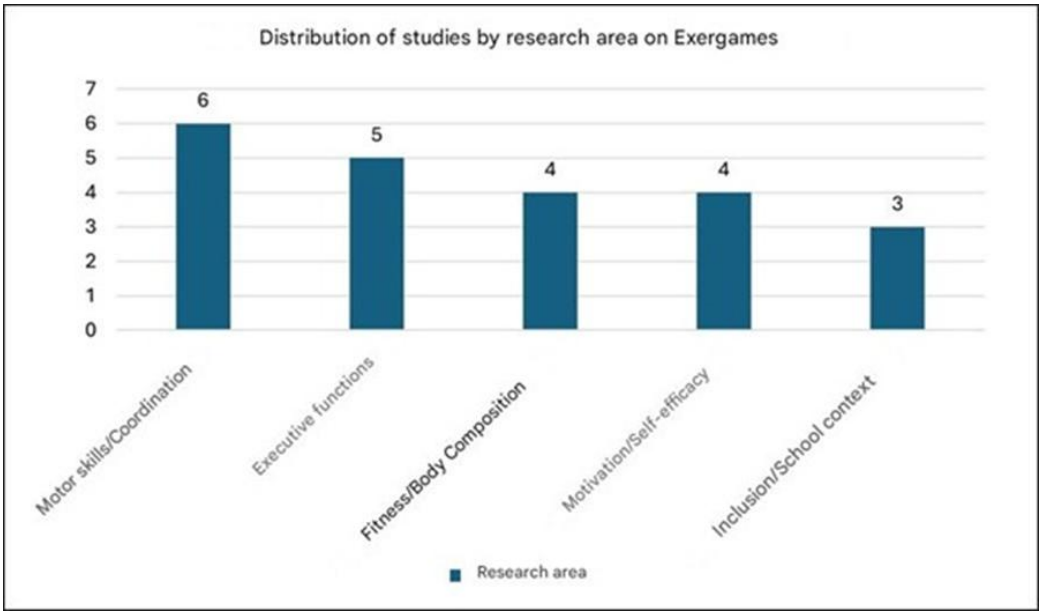

Fig 3. Summary of frequency of studies by research area. (*Source:* own elaboration).

The various participants were involved in exergame sessions with varying time intervals, ranging from 20 minutes once a week (Gao et al., 2017) to 60 minutes three times a week (Comeras-Chueca et al., 2022). Tools and protocols aimed at assessing motor skills, executive functions, balance, motor abilities, and fitness were used. Executive functions were assessed as follows:

- attention and inhibition: Go/No-go task and FAIR test (Ji et al., 2023), ERP (Xion et al., 2019; Gai et al., 2021), Stroop test and Flanker task (Kolovelonis et al., 2023)
- cognitive flexibility: Switching Task (Gai et al., 2021) and Trail Making Test B (Kolovelonis et al., 2023)
- working memory: N-back task (Gai et al., 2021), Digit Span (Xion et al., 2019)
- global executive functions: integrated physical-cognitive observation (Xiong et al., 2019; Liu et al., 2022)

With regard to motor assessment, the following were used:
- MABC-2 test (Cavalcante Neto et al., 2019) for assessing motor skills and coordination
- Handgrip strength, jump, and speed tests (Comeras-Chueca et al., 2022) for assessing muscle strength and MABC-2, standing broad jump (Smits-Engelsman et al., 2021) for assessing motor coordination, endurance, and motor skills in general
- static balance test (Sgrò et al., 2018) for the assessment of balance and postural control
- TGMD-3 (Ye et al., 2018) for the assessment of motor development

Some studies have conducted assessments using questionnaires, including assessments of selective attention and self-control in children with ADHD (Ji et al., 2023), children's perception of physical competence and social acceptance (Xiong et al., 2019), and the gaming experience and use of exergames in preschoolers (Liu et al., 2022). In all the studies examined, the assessment was carried out pre- and post-test, at the end of the experimental interventions. Most studies considered an intervention period ranging from 6 to 12 weeks to evaluate its effects. Some studies (Gao et al., 2017; Kolovelonis et al., 2023), on the other hand, considered shorter or more acute assessments (pre-post assessments carried out in single sessions or in a single day). Meanwhile, the longer studies (Marsigliante et al., 2024; Roglin et al., 2024) had intervals ranging from 3 to 6 months. Table 2 summarizes all the protocols analyzed.

Table 2. Protocol table. (*Source:* own elaboration).

Author, year	Sample (age and origin)	Duration	Scope	Activity	Results	Search Engine/website
Cavalcante Neto et al., 2019	Total: 32 children with DCD. Ages 7–10. Brazil.	6 weeks	Comparison of training with Wii and training without Wii for motor learning in children with DCD.	Training sessions with Wii twice a week for 60 minutes.	Improvements: motor learning.	Google Scholar
Comeras-Chueca et al., 2022	Total: 29 children. Ages 9–10. Spain.	5 months	Effects of exergames on obese or overweight children.	Training sessions with Xbox, dance mats, and a cycling simulator; 60 minutes, 3 times a week.	Improvements: muscle tone, physical activity, and motor skills in obese or overweight children.	Google Scholar
Gai et al., 2021	Total: 122 children. Ages 4–6. China.	6 weeks	Evaluation of the effects of exergames on executive functions.	30-minute exergame sessions for each child (frequency not specified).	Improvements: executive function, especially working memory.	Google Scholar
Gao et al., 2017	Total: 261 children (2 groups). Age 7–8 years. United States.	2 years	Evaluation of the use of exergames on children's sedentary behaviour integrated into school programs.	125 minutes of weekly physical activity based on exergames; 125 minutes of physical activity for the control group.	Positive effects on physical activity levels.	PubMed
Ji et al., 2023	Total: 30 children with ADHD. Ages 8–12. South Korea.	4 weeks	Use of exergames to assess the effects of aerobic exercise on attention in children with ADHD.	Exergames and bicycle sessions, 30 minutes, 3 times a week.	Improvements: attention and self-control.	PubMed
Kolovenolis, 2023	Total: 122 children (2 studies). Age 8–10. Greece.	4 weeks	Effects of exergames on executive functions and interest in physical education.	Exergame sessions with Just Dance, 15–20 minutes, one-off	Positive effects on executive functions.	PubMed

				(acute effect).		
Kwon et al., 2022	Total: 52 children with DD. Ages 7–12. South Korea.	12 weeks	Effectiveness of exergames on physical and motor fitness in children with DD.	ICT-based exergames program, 40 minutes twice a week.	Positive effects on muscle strength and movement.	PubMed
Lin et al., 2025	Total: 68 children (2 groups). Age 10–11. Taiwan.	8 weeks	Use of exergames for children's physical performance and health.	Exergame sessions with Active Arcade, Laser Dodge, Cone Knockout, Box Attack; 40–45 minutes, 3 times a week.	Improvements: muscle strength and endurance; cardiovascular endurance.	PubMed
Liu et al., 2022	Total: 48 children (2 groups). Ages 4–5. China.	4 weeks	Effectiveness of exergames for executive functions.	Exergames sessions with Just Dance, 30 minutes twice a week.	Improvements in executive functions: shifting, inhibition, working memory (WM).	PubMed
Marsigliante et al., 2024	Total: 64 children. Age 9–10. Italy.	6 months	Effects of exergames on physical composition and athletic ability.	Exergames sessions 50 minutes, 3 times a week with Kinect Adventures, Xbox.	Improvements: BMI, leg power, muscle strength, flexibility, aerobic capacity.	PubMed
Roglin et al., 2024	Total: 58 children. Ages 10–12. Germany.	3 months	Use of exergames to improve BMI and encourage physical activity.	15–20-minute exergame sessions twice a week.	Improvements: PSC, flexibility, coordination, strength, and speed.	PubMed
Sgrò et al., 2018	Total: 57 children. Age 8–10. Italy.	16 weeks	Effectiveness of exergames for balance and movement skills.	Exergames sessions with Kinect Adventures, 30 minutes once a week.	Improvements: balance.	Italian Journal of Education Research
Smits-Engelsman et al., 2021	Total: 60 children. Ages 7–12. South Africa.	10 weeks	Effects of exergames on fitness performance	30-minute exergame sessions	Improvements: motor coordination, balance,	PubMed

			in children with coordination disorders.	twice a week.	aerobic and anaerobic capacity.	
Xiong, Zhang, Gao, 2019	Total: 60 children. Ages 4–5. China.	8 weeks	Assessment of the effects of exergames on executive functions.	20-minute exergame sessions three times a week.	Improvements: executive functions, physical and social skills.	PubMed
Ye et al., 2018	Total: 261 children (2 groups). Age 7–9. United States.	9 months	Combination of exergames and traditional physical education; promotion of physical activity.	Exergames sessions in pairs or groups with Kinect, Just Dance, Wii; 40 minutes twice a week.	Improvements: MSC, BMI, musculoskeletal fitness, motivation.	Google Scholar

Discussions

The main objective of this review was to investigate the role of exergames as an innovative tool for personal education, particularly for children and motor development. The systematic review of recent studies confirms that exergames are becoming genuine multidimensional intervention tools for children, especially in educational contexts. The data that emerged highlights how exergames are a motivating, multisensory, and accessible resource, capable of promoting significant improvements on several levels: motor, cognitive, emotional, and social.

The most commonly observed positive effects were those related to motor skills, which represent the most widely supported areas of intervention. For example, studies such as those by Cavalcante Neto et al. (2019) and Smits-Engelsman et al. (2021) on children with DCD and Comeras-Chueca et al. (2022) on overweight children have shown various improvements in balance, muscle strength, motor skills, and coordination, using standardized tests such as MABC-2 and TGMD-3. Important results are also evident in typically developing children (Sgrò et al., 2018; Ye et al., 2018; Kwon et al., 2022). The interactive and immersive composition of these tools facilitates motor learning thanks to the various stimulating virtual environments, immediate feedback, and different levels of difficulty that can be adapted, also helping to reduce performance anxiety in children, particularly those with disabilities. With regard to executive functions, some studies (Gai et al., 2021; Ji et al., 2023; Kolovelonis et al., 2023) have highlighted positive effects on attention, cognitive flexibility, inhibition, and working memory, especially when the game requires greater cognitive as well as physical effort. Studies by Xiong et al. (2019) and Liu et al. (2022) conducted on preschool children and those by Marsigliante et al. (2024) have also shown that regular sessions with exergames stimulate cognitive functions. In fact, it has been shown that the potential of these tools is greater when they are used in structured and sustained protocols (lasting from six to several weeks). One of the most notable strengths is the relational and emotional dimension. The questionnaires administered (perception of competence, satisfaction, self-efficacy, usability) show that children experience exergames as fun, stimulating, and rewarding activities. For example, Xion et al. (2019), Liu et al. (2022), and Roglin et al. (2024) confirm a positive increase in physical self-perception and motor self-efficacy. This demonstrates that the gaming experience is not limited to cognitive or motor performance but has cross-cutting effects on engagement and motivation to participate, especially in children who usually show a lack of motivation in traditional physical activities.

Furthermore, studies conducted by Lin et al. (2025) and Marsigliante et al. (2024) found improvements in cardiovascular endurance, energy expenditure, and body composition. In particular, in overweight children, exergames act as catalysts for moderate-vigorous physical activity (Gao et al., 2017), becoming a possible alternative to traditional physical exercise. Smits-Engelsman and colleagues (2021) highlighted some positive effects on fitness even in children with DCD. One of the most promising aspects concerns the integration of exergames in the school context, both as an integral tool for physical education lessons and as an inclusive and compensatory tool.

Different studies (Gao et al., 2017; Marsigliante et al., 2024; Lin et al., 2025) have shown how effective exergames can be when used in schools as part of physical education programs. To back this up, some practical ways to use them have been suggested, including:

- weekly workshops lasting 30-45 minutes with rotations between classic physical activities and those using exergames
- small group sessions to be carried out in equipped spaces
- active breaks between curricular lessons to promote concentration
- compensatory activities to support children with disabilities or special educational needs

These approaches promote the motor and social inclusion of all children, particularly reducing barriers to participation for those with disabilities. In fact, studies such as those by Comeras-Chueca et al. (2022) and Ji et al. (2023) show that the use of exergames gives these children the opportunity to participate in activities at the same level as their peers, improving their self-esteem and self-efficacy. The study by Roglin et al. (2024) highlighted improvements in terms of physical self-concept, thus contributing not only to motor inclusion but also to social inclusion. In addition, avatars, adaptive levels, and immediate positive feedback provide a non-judgmental environment where children can feel confident in exploring various movements.

This analysis revealed several strengths. The first concerns the multidimensionality of the positive effects: exergames not only have an impact on motor skills, but also on cognitive, social, and emotional skills. Considering the motor aspect, the study by Sgrò et al. (2018) showed that exergames used in primary schools promote the acquisition of static and dynamic balance skills. The motor domain is the most studied and has the most solid results. This confirms that exergames are very effective, especially for improving balance, coordination, gross motor skills, and strength, particularly in overweight children and those with DCD (Cavalcante Neto et al., 2019; Comeras-Chueca et al., 2022). Good results have also emerged in the cognitive domain thanks to the addition of challenges and decision-making processes during the game (Gai et al., 2021).

Relational and affective effects, although present, were measured in a minority of cases. However, where they did emerge, they demonstrated benefits in terms of motivation and self-concept (Xiong et al., 2019; Roglin et al., 2024). Another positive aspect concerns intrinsic motivation and active involvement. The study by Ye and colleagues (2018) shows how children who show little participation in physical activity managed to be more active and involved during exergame sessions with the Xbox Kinect. Due to the playful component, they perceive exergames as a fun and stimulating activity. This increases their active participation time by reducing the frustration and boredom associated with traditional exercise. The research focused particularly in the school setting found to be another strength and considered an ideal environment in which to use these new technologies. Their integration in the school setting was found to be very effective in compensating for motor difficulties, increasing physical activity, and enhancing psychophysical well-being.

Therefore, based on these results, exergames could be integrated into school curricula in a structured way. In addition, the following review found that they are a great potential for inclusiveness as they provide a structured, predictable, and positive context where children with disabilities and special educational needs can participate together with their peers. Benefits from the cognitive regulation offered by play in children with ADHD (Ji et al., 2023), improvements in muscular endurance and complex motor skills in those with DCD (Smits-Engelsman et al., 2021), and improvements in the social integration of children with developmental disabilities (Kwon et al., 2022) have been highlighted in particular. Although few studies have been analyzed, this domain represents a promising area. The final positive aspect that emerged from the review concerns the growth of scientific evidence. The review is based on randomized controlled trials and quasi-experimental studies, with the use of standardized assessment tools that increase the reliability of the results. In addition, the research predicts promising future prospects, especially in school settings and with respect to inclusiveness. However, critical points also emerged in this review, including the methodological heterogeneity of the studies. The different protocols vary greatly with respect to duration (from 4 weeks to 6 months), technologies used (custom platforms, Wii, Xbox Kinect), frequency (1 to 5 sessions per week), and with respect to target audience. This variety makes it difficult to compare results and do robust meta-analyses.

While integrating exergames into schools is highly beneficial, accessibility and costs must also be taken into account. Implementing these tools in schools requires the purchase of consoles, sensors, and software, as well as adequate space, staff trained in their educational use, and ongoing technical maintenance. Costs are one of the main problems. An example of this is the study by Known and colleagues (2022), where the exergames intervention includes the use of biometric sensors and specific software that are difficult to apply in public school settings with limited resources and budgets. Furthermore, many studies have found that exergames have been incorporated into complex programs with multiple variables (mixed interventions: cognitive interventions, motor education, etc.), making it difficult to attribute improvements solely to these tools. For example, the study by Ye

and colleagues (2018) combines exergames with traditional fitness, but it is unclear which of the two components is more effective. Furthermore, the review highlighted the possibility of side effects and inconsistency in response. Not all children respond in the same way. Some may experience exergames in a competitive or even frustrating way if not mediated, leading to demotivation. Furthermore, incorrect or excessive use of these tools could lead to compensatory sedentary behavior ("I did the exercise with the game, so now I'm not moving anymore") or dependence on the tool. All of this can become a reality if the context is not well structured. The review highlights the potential of exergames as possible tools for educational interventions. They are capable of integrating movement with emotional, cognitive, and social elements. However, their effectiveness depends on the quality of the context in which they are used, i.e., structured protocols, continuous monitoring, and trained operators are essential. Therefore, further longitudinal studies and greater standardization of protocols are needed to fully exploit their potential.

Conclusions and limitations

Exergames are characterised by their ability to integrate physical movement with play and technology, stimulating active and engaging learning geared towards the child's autonomy. They promote specific motor skills such as coordination, muscle strength, and balance, stimulating executive functions, including attention, cognitive flexibility, working memory, and planning. The studies examined in this work demonstrate how these tools can be an effective educational resource for supporting children's integral development. Exergames are also useful in promoting emotional engagement, intrinsic motivation, and self-perception, all of which are important aspects for children's psychological and physical well-being and participation, even in inclusive contexts. From the pedagogical point of view, exergames can be included in a body- and person-centered education, where movement is not only considered as physical exercise, but as a means of relating, discovering, and learning. The inclusion of these new technologies in physical activity in schools can support the promotion of a more active and healthy lifestyle, the inclusion of students with special educational needs or disabilities, and education in cooperation and management through play. Despite the positive results, the review also highlighted some limitations, in particular:

- variations in protocols: differences in duration, frequency of sessions, and tools used
- limited number of participants
- lack of follow-up
- little consideration given to the school environment and poor direct involvement of teachers

In consideration of the various limitations, future research should focus primarily on more structured experimental studies with control groups and larger, more diverse samples. In addition, they should include long-term analysis to assess the persistence of effects and an in-depth examination of educational aspects, including observations on the relational climate, cooperation, and the role of the teacher. Moreover, there should be in-depth studies on teacher training geared towards the critical and conscious use of exergames. Finally, to obtain a more complete picture, it could be useful in the future to develop personalized exergames based on the individual needs of children and the educational objectives to be integrated into the various school physical education curricula.
In conclusion, exergames can act as a bridge between learning, play, and movement, promoting the body as a tool for comprehensive education. When designed and used in a targeted manner, they become fundamental in promoting inclusion, health, and child development. The educational challenge today is to integrate these tools into a coherent pedagogical project that is not based solely on technological innovation but aims to develop the child as a whole person through a lively and meaningful experience of the body in motion.

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